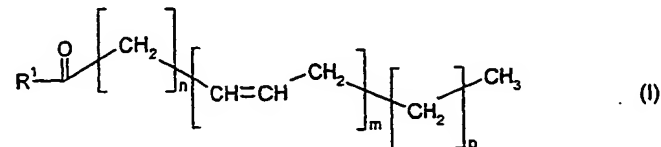


What is claimed is:

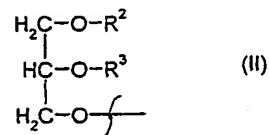
1. A process for the production of compounds of the following general formula I



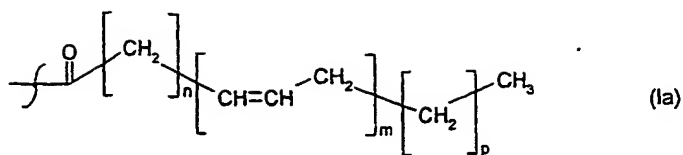
- 5 in transgenic organisms with a content of at least 1 % by weight of said compounds - referred to the total lipid content of said organism which comprises the following steps:
- a) introduction of at least one nucleic acid sequence in a transgenic organism, which encodes a  $\Delta$ -9-elongase, and
- b) introduction of at least one second nucleic acid sequence which encodes a  $\Delta$ -8-desaturase, and
- 10 c) if necessary introduction of at least a one third nucleic acid sequence, which encodes a  $\Delta$ -5-desaturase, and
- d) cultivating and harvesting of said organism; and

where the variables and substituents in formula I have the following meanings:

- 15  $R^1$  = hydroxyl-, Coenzyme A-(Thioester), phosphatidylcholine-, phosphatidylethanolamine-, phosphatidylglycerol-, diphosphatidylglycerol-, phosphatidylserine-, phosphatidylinositol-, sphingolipid-, glycosphingolipid- or a residue of the general formula II:



- 20  $R^2$  = hydrogen-, phosphatidylcholine-, phosphatidylethanolamine-, phosphatidylglycerol-, diphosphatidylglycerol-, phosphatidylserine-, phosphatidylinositol-, sphingolipid-, glycosphingolipid-, glycosphingolipid- or saturated or unsaturated  $C_2-C_{24}$ -alkylcarbonyl-,
- $R^3$  = hydrogen-, saturated or unsaturated  $C_2-C_{24}$ -alkylcarbonyl-, or  $R^2$  and  $R^3$  independent of each other a residue of the formula Ia:



$n = 3, 4$  or  $6$ ,  $m = 3, 4$  or  $5$  and  $p = 0$  or  $3$ .

2. The process as claimed in claim 1, wherein the nucleic acid sequences which encode polypeptides with  $\Delta$ -8-desaturase,  $\Delta$ -9-elongase or  $\Delta$ -5-desaturase are selected from the group consisting of
  - a) a nucleic acid sequence depicted in SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7 or SEQ ID NO: 9
  - b) a nucleic acid sequence which is derived from the sequence depicted in SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7 or SEQ ID NO: 9 according to the degeneracy of the genetic code,
  - c) derivatives of the sequence depicted in SEQ ID NO: 1, SEQ ID NO: 3, SEQ ID NO: 5, SEQ ID NO: 7 or SEQ ID NO: 9 which encodes polypeptides having at least 50 % homology to the sequence encoding amino acid sequences depicted in SEQ ID NO: 2, SEQ ID NO: 4, SEQ ID NO: 6, SEQ ID NO: 8 or SEQ ID NO: 10 and which sequences function as a  $\Delta$ -8-desaturase,  $\Delta$ -9-elongase or  $\Delta$ -5-desaturase.
3. The process as claimed in claim 1 or claim 2, wherein the substituents  $R^2$  and  $R^3$  are independent of each other saturated or unsaturated  $C_{10}$ - $C_{22}$ -alkylcarbonyl-.
4. The process as claimed in any of the claims 1 to 3, wherein the substituents  $R^2$  and  $R^3$  are independent of each other saturated or unsaturated  $C_{16}$ -,  $C_{18}$ -,  $C_{20}$ - or  $C_{22}$ -alkylcarbonyl-.
5. The process as claimed in any of the claims 1 to 4, wherein the substituents  $R^2$  and  $R^3$  are independent of each other unsaturated  $C_{16}$ -,  $C_{18}$ -,  $C_{20}$ - or  $C_{22}$ -alkylcarbonyl- with at least three double bonds.
6. The process as claimed in any of the claims 1 to 5, wherein the transgenic organism is an oil producing plant.
7. The process as claimed in any of the claims 1 to 6, wherein the transgenic plant is selected from the group consisting of rapeseed, poppy, mustard, hemp, castor bean, ses-

ame, olive, calendula, punica, hazel nut, almond, macadamia, avocado, pumpkin, walnut, laurel, pistachio, primrose, canola, peanut, linseed, soybean, safflower, sunflower and borage.

- 5 8. The process as claimed in any of the claims 1 to 7, wherein the compounds of the general formula I are isolated in the form of their oils, lipids or free fatty acids.
9. The process as claimed in any of the claims 1 to 8, wherein the compounds of the general formula I are isolated in a concentration of at least 5 % by weight referred to the total lipid content.
- 10 10. An isolated nucleic acid sequence comprising a nucleotide sequence which encodes a  $\Delta$ -8-desaturase selected from the group consisting of
- a) a nucleic acid sequence depicted in SEQ ID NO: 1,
- b) a nucleic acid sequence which is derived from the sequence depicted in SEQ ID NO: 1 according to the degeneracy of the genetic code and which sequences function as a  $\Delta$ -8-desaturase.
- 15 11. An isolated nucleic acid sequence comprising a nucleotide sequence which encodes a  $\Delta$ -5-desaturase selected from the group consisting of
- a) a nucleic acid sequence depicted in SEQ ID NO: 5,
- b) a nucleic acid sequence which is derived from the sequence depicted in SEQ ID NO: 5 according to the degeneracy of the genetic code,
- 20 c) derivatives of the sequence depicted in SEQ ID NO: 5 which encodes polypeptides having at least 50 % homology to the sequence encoding amino acid sequences depicted in SEQ ID NO: 6 and which sequences function as a  $\Delta$ -5-desaturase.
12. An amino-acid sequence encoded by an isolated nucleic acid sequence as claimed in claims 10 or claim 11.
- 25 13. A gene construct comprising an isolated nucleic acid having the sequence SEQ ID NO: 1 or SEQ ID NO: 5 as claimed in claim 10 or claim 11, where the nucleic acid is functionally linked to one or more regulatory signals.
14. A gene construct as claimed in claim 13, whose gene expression is increased by the regulatory signals.

15. A vector comprising a nucleic acid as claimed in claim 10 or claim 11 or a gene construct as claimed in claim 14.
16. An organism comprising at least one nucleic acid as claimed in claim 10 or claim 11, a gene construct as claimed in claim 13 or a vector as claimed in claim 15.
- 5 17. The organism as claimed in claim 16, wherein the organism is a microorganism, a non-human animal or a plant.
18. The organism as claimed in claim 16 or 17, wherein the organism is a transgenic plant.